SHOPPING PATTERN ANALYSIS SYSTEM AND METHOD BASED ON RFID

TECHNICAL FIELD

The present invention relates to a shopping pattern analysis

5   system, and more particularly to a system and method for detecting a location of a consumer in a store using a RFID, analyzing a shopping traffic line of the consumer by checking shopping time of the consumer in a zone in the store and tracing the location of the consumer, and analyzing a shopping pattern of the consumer using

10   a result of the analysis for the shopping traffic line.

BACKGROUND ART

In recent years, studies of ubiquitous networking and ubiquitous computing have been actively made, and technologies

15   for automatically recognizing locations of objects in a wireless way and detecting moving paths of the objects and systems employing such technologies have been issued.

A ubiquitous environment is an environment in which a user can receive computing services desired by him at any time and at

20   any place. There is a need of a link technique for connecting a virtual world to a real world in order to implement such a ubiquitous environment.

An automatic recognition technique is utilized to link the virtual world to the real world. The automatic recognition

25   technique may include a bar code system, an optical character

recognition system, a smart card system, and a RFID (Radio Frequency Identification) system.

Of these systems, the RFID system is a system having the most realistic applicability to a large-scaled store and the like.

5   The RFID system, which implements a radio identification technique using a radio frequency, includes a transponder, which is generally called a tag, a computer, and other equipments for processing data, as basic components.

In the RFID system, a tag attached to a movable recognition
10   object generates unique information of the tag as a response signal to a signal received from an antenna, a reader receives the generated response signal through an antenna, and a terminal (server) connected to the reader identifies a location of the recognition object by analyzing the unique information of the tag received
15   from the reader.

The tag may be configured in different shapes, inserted into a plastic card or a human skin tissue, and embedded in and attached to other objects in various and convenient ways.

In addition, the tag may be divided into an active tag and
20   a passive tag. The active tag is a readable and writable tag including a power supply contained therein and a passive age is a tag using energy received from an antenna connected to a reader.

An application based on the RFID has characteristics different from those of existing general applications. While flow of program
25   execution is decided by a system request in the existing general

applications, flow of program execution may be decided by a user request in the RFID-based application. That is, in the RFID-based application, an event is generated in real time when a reader identifies a tag, and a program is executed by the generated event.

5   Accordingly, , it is desirable to utilize a RFID technique for recognizing and tracing individual objects for the purpose of achieving a complete ubiquitous computing, and there is a keen need of development of applications, which can be applied as store management systems using the RFID technique.

10   Particularly, in the case of large-scale stores used by a great number of persons, there is a need of development of systems, which can manage goods, analyzes shopping patterns of consumers, goods preference of consumers, etc., and utilizes results of the analysis under the ubiquitous environment.

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SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a system and method for analyzing a shopping pattern of a consumer in order to achieve optimal store management and efficient consumer

20   management by detecting a current location of the consumer and shopping time at the current location in a large-scale store using a RFID and analyzing a shopping traffic line of the consumer.

To achieve the above objects, according to an aspect, the present invention provides a shopping pattern analyzing system

25   comprising a tag attached to a shopping cart and having mobility

corresponding to a shopping consumer; a plurality of readers for reading information of the tag through local area radio communication and transmitting the read information through a network; an analysis module for analyzing a shopping pattern of the consumer from the information of the tag read by the readers; a database in which the information of the tag and analysis data of the analysis module are stored; a system server for managing the analysis data of the analysis module by performing communication with the readers, and controlling the analysis module and the database; and a monitoring terminal for receiving a result of the analysis for the shopping pattern from the system server and displaying the received result of the analysis.

According to another aspect, the present invention provides a shopping pattern analyzing method comprising the steps of detecting a location of a consumer in a store corresponding to a location of a tag according to a signal from the tag sensed by a reader and storing information on the detected location of the consumer in a database; checking stay shopping time in a relevant zone in which the location of the consumer is detected and storing the checked stay shopping time in the database; tracing a shopping traffic line of the consumer in association of the consumer location information and the zone in which the stay shopping time is generated and storing the traced shopping traffic line information in the database; analyzing zone preference of the consumer from the stay shopping time information and goods information, which are stored

in the database, and storing the analyzed preference in database;

analyzing a shopping pattern of the consumer from the shopping

traffic line information, the stay shopping time information, and

the goods information, which are stored in the database, and

5   storing a result of the analysis in the database; and generating

or updating shopping profile information of the consumer and

storing the generated or updated shopping profile information in

the database.

According to still another aspect, the present invention

10   provides a shopping pattern analyzing method comprising the steps

of registering consumer information in a database when a consumer

enters a store; detecting a location of the consumer in the store

corresponding to a location of a tag according to a signal from

the tag sensed by a reader and storing information on the detected

15   location of the consumer in the database; determining whether or

not stay shopping time of the consumer in a certain zone in the

store exceeds preset threshold time; searching for a shopping

profile of the consumer stored in the database if it is determined

that the stay shopping time exceeds the preset threshold time;

20   determining whether or not a current stay shopping zone is included

in the shopping profile of the consumer; selecting a preference

zone of the consumer from the shopping profile information of the

consumer if it is determined that the current stay shopping zone

is included in the shopping profile of the consumer; transmitting

25   information on the preference zone and information on goods of

interest of the consumer in the preference zone to a consumer

terminal; and adding information on a relevant moving zone to the

shopping profile of the consumer stored in the database.

5   BRIEF DESCRIPTION OF THE DRAWING

· Fig. 1 is a block diagram of a shopping pattern analysis system

according to a preferred embodiment of the present invention.

Fig. 2 is a detailed block diagram of an analysis module

according to a preferred embodiment of the present invention.

10   Fig. 3 is an exemplary diagram of a consumer traffic line

tracing screen according to a preferred embodiment of the present

invention.

Fig. 4 is an exemplary diagram of a user interface screen

for shopping traffic lines of individual consumers according to

15   a preferred embodiment of the present invention.

Fig. 5 is an exemplary diagram of a user interface screen

for shopping traffic lines of all consumers for each time zone

according to a preferred embodiment of the present invention.

Fig. 6 is an exemplary diagram of a user interface screen

20   for consumer congestion of each zone in a store according to a

preferred embodiment of the present invention.

Fig. 7 is an exemplary diagram of a user interface screen

for statistics of calculation data and results of analysis

according to a preferred embodiment of the present invention.

25   Fig. 8 is a flow chart illustrating a shopping pattern analysis

method according to an embodiment of the present invention.

Fig. 9 is a flow chart illustrating a shopping pattern analysis method according to another embodiment of the present invention.

5   BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, a shopping pattern analysis system and method according to preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

Fig. 1 is a block diagram of a shopping pattern analysis system
10   according to a preferred embodiment of the present invention.

Referring to Fig. 1, a shopping pattern analysis system according to a preferred embodiment of the present invention includes a tag 11 attached to a shopping cart 10 or the like, a plurality of readers 21, a system server 30, an analysis module
15   40, a database 50, a monitoring terminal 60, a plurality of POS terminals 71, a wired/wireless terminal 80, a consumer terminal 90, and a network 100.

The tag 11 is attached at a proper position of means 10 into which goods shopped by a consumer are put (hereinafter, referred
20   to as 'shopping cart'), such as a shopping cart or a shopping basket provided in a store, and has a mobility corresponding to the consumer. Accordingly, a traffic line of the shopping cart 10 may be applied as a shopping traffic line of the consumer.

The plurality of readers 21, which is installed at specified
25   positions of a goods display stand or a counter in the store, reads

information of the tag 11 through local area radio communication with the tag 11, and transmits the read information to the system server 30 via the network 100. It is shown in Fig. 1 that the readers are grouped into a read unit 20.

5   The plurality of POS terminals 71, which is installed at the counter in the store for settling for goods shopped by the consumer, transmits information on the consumer obtained in the settlement procedure and information on the goods shopped by consumer to the system server 30 via the network 100. It is shown in Fig. 1 that
10   the POS terminal 71 are grouped into a POS terminal unit 70.

        The wired/wireless terminal 80, which is installed at an entrance and exit spot in the store, recognizes a card on which the consumer information is recorded (hereinafter, referred to as 'consumer card') in a contact or non-contact manner when the
15   consumer enters the store, and transmits the consumer information recorded on the consumer card to the system server 30 via the network.

        At this time, it is preferable that the readers 21 are installed at a position at which the wired/wireless terminal 80 is installed. In this case, the wired/wireless terminal 80 identifies the
20   consumer card when the consumer enters the store, and the identified consumer information can be combined with information of the tag 11 attached to the shopping cart 10 used by the consumer.

        The combined information can be used to implement a service for generating or updating shopping profile information of the
25   consumer, analyzing and inferring information required while the

consumer is shopping, and providing the inferred information to the consumer terminal 90 carried by the consumer.

If the consumer has no consumer card or the consumer information cannot be identified through the wired/wireless terminal 80 according selective intention of the consumer, the consumer information obtained by the POS terminals 71 in the settlement procedure and the tag information can be combined and managed. In this case, although the service for transmitting the information required while the consumer is shopping to the consumer terminal 90 cannot be implemented, it is possible to analyze a shopping pattern of the consumer and generate or update the shopping profile information of the consumer.

The system server 30, which is associated with the analysis module 40, the monitoring terminal 60 and the consumer terminal 80, stores various kinds of information received from the readers 21, the POS terminals 71 and the wired/wireless terminal 80 in the database 50 and controls the analysis module 40 and the database 50.

The analysis module 40 analyzes the shopping pattern of the consumer using the various kinds of information obtained from the readers 21, the POS terminals 71 and the wired/wireless terminal 80 and stores a result of the analysis in the database 50.

The database 50 stores the various kinds of information obtained from the readers 21, the POS terminals 71 and the wired/wireless terminal 80 and the analysis data of the analysis

module 40.

The consumer terminal 90 receives the various kinds of information required while the consumer is shopping from the system server 30, and is preferably configured by a portable communication device such as a mobile telephone or a PDA.

Fig. 2 is a detailed block diagram of the analysis module 40 according to a preferred embodiment of the present invention.

Referring to Fig. 2, the analysis module 40 according to the preferred embodiment of the present invention includes a consumer location detecting unit 41, a shopping time checking unit 42, a shopping traffic line tracing unit 43, a preference zone analyzing unit 44, a shopping pattern analyzing unit 45, a shopping profile analyzing unit 46, and a potential information predicting unit 47.

The consumer location detecting unit 41 detects a location of the consumer in the store, which corresponds to a location of the tag 11, based on a signal from the tag 11 sensed by the readers 21, and stores information on the detected location of the consumer in the database 50.

The shopping time checking unit 42 checks time for which the consumer stays at the detected location of the consumer in the store, determines the checked time as stay shopping time in a relevant zone if the consumer stays for more than preset threshold time, and stores a result of the determination in the database 50.

The stay shopping time in the zone is calculated using a difference between time at a current location of the consumer, which is detected by the readers 21, and time at a previous location of the consumer, according to the following Equation 1.

[Equation 1]

$$T_{stay,\,zone(x,y,z)} = \left| T_{in,\,zone(x,y,z)} - T_{out,\,zone(x,y,z)} \right|$$

(where, $T_{stay,\,zone(x,y,z)} \geq \alpha$)

$T_{stay,\,zone(x,y,z)}$: stay shopping time

$T_{in,\,zone(x,y,z)}$: time when the consumer enters a specified zone

$T_{out,\,zone(x,y,z)}$: time when the consumer departs from a specified zone

x : a horizontal axis coordinate value when the store is viewed from the top

y : a vertical axis coordinate value when the store is viewed from the top

z: the number of floors of the store

Where, the stay shopping time must be more than preset threshold time α and is determined as effective stay shopping time if the consumer stays in the relevant zone for more than the threshold time α.

The threshold time α, which is allowable minimal stay time in the relevant zone, is differently defined for each goods category and is calculated according to the following Equation 2.

[Equation 2]

$$\alpha = Ave[T_{stay,\,zone(x,y,z)}] - Ave[T_{pass,\,zone(x,y,z)}]$$

(where, $Min[T_{stay\_bought, zone(x,y,z)}] \leq \alpha \leq Max[T_{stay\_bought, zone(x,y,z)}]$)

$Ave[T_{stay, zone(x,y,z)}]$: average of stay shopping time for each zone

$Ave[T_{pass, zone(x,y,z)}]$: average of moving time in a relevant zone

$Max[T_{stay\_bought, zone(x,y,z)}]$: maximal value of stay shopping time for

each zone where the consumer actually shops

$Min[T_{stay\_bought, zone(x,y,z)}]$: minimal value of stay shopping time for

each zone where the consumer actually shops

The threshold time α must have a value defined between the

maximal value and the minimal value of the stay shopping time spent

in each zone when goods in the relevant zone are actually shopped.

This must be corrected.

The average moving time in the relevant zone will be

differently calculated for each store depending on the length of

a stand, an arrangement range of groups of goods, and the number

of installed readers.

The shopping traffic line tracing unit 43 traces a shopping

traffic line of the consumer in association of the location

information of the consumer with a zone where the stay shopping

time occurs. That is, the shopping traffic line tracing unit 43

can trace the shopping traffic line of the consumer by tracing

locations of the consumer in the store and connecting the locations

one another, as shown in Fig. 3.

The shopping traffic line of the consumer shown in Fig. 3

is indicated by a solid arrow, while an expected shopping traffic

line drawn based on a result of inference, which will be described

later, is indicated by a dotted arrow.

The shopping traffic line tracing unit 43 can trace and analyze shopping traffic lines of individual consumers and hourly, daily and monthly shopping traffic lines of all consumers. A result of the analysis can be displayed on a screen through the monitoring terminal 60, as shown in Figs. 4 and 5.

In addition, the shopping traffic line tracing unit 43 can analyze shopping congestion in each zone in the store based on information on the analyzed shopping traffic lines. The analyzed shopping congestion can be displayed on the screen through the monitoring terminal 60, as shown in Fig. 6.

In addition, the data calculated and analyzed by the shopping traffic line tracing unit 43 can be displayed as a graph and quantitative real data values through the monitoring terminal 60, as shown in Fig. 7.

The shopping traffic line tracing unit 43 stores analyzed shopping goods information and sales information in the database 50 in association with the analyzed shopping traffic line-related information.

On the other hand, the shopping traffic line-related information stored in the database 50 may be grouped into profiles of the consumer, for example, for age, sex and the like. It is preferable that the shopping goods information and the sales information are stored in the database 50 in association with the shopping traffic line information.

As described above, the consumer location detecting unit 41, the shopping time checking unit 42 and the shopping traffic line tracing unit 43 stores the information on the location of the consumer, the stay shopping time, the shopping traffic line, respectively, in the database 50. It is preferable that the information is stored in the database 50 in association with the shopping profiles of the user.

On the other hand, various kinds of information provided by the shopping traffic line tracing unit 43 used for preference zone analysis and shopping pattern analysis, which will be described, can be provided after being registered in the database 50 or can be directly provided.

The preference zone analyzing unit 44 calculates preference of a relevant zone using the stay shopping time of the consumer for each zone and shopping information on goods in the relevant zone and stores the calculated preference in the database 50.

The zone preference, which is used to calculate a degree of consumer's interest in goods in a certain zone in the store, is calculated according to the following Equation 3.

[Equation 3]

$$P_{zone(x,y,z)} = \left(\frac{\sum_{i=1}^{n} C_{bought(i),zone(x,y,z)}}{C_{bought,total}} \times \beta_1 \right) \times \left(\frac{\sum_{i=1}^{n} T_{stay(i),zone(x,y,z)}}{T_{stay,total}} \times \beta_2 \right)$$

$C_{bought(i),zone(x,y,z)}$: the number of goods that the consumer shops in a certain zone of the store at an ith shopping

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$C_{bought, total}$: the number of goods that the consumer shops in the store

$T_{stay, zone(x,y,z)}$: stay shopping time of the consumer for each zone

$T_{stay, total}$: the sum of stay shopping time of the consumer in the store (total shopping time)

i : the number of times of shopping

β_1 : weight of shopping goods of the consumer

β_2 : weight of shopping time of the consumer

As can be seen from Fig. 3, the zone preference is corrected using a shopping goods weight and a shopping time weight.

The shopping goods weight is a value used to correct the preference for goods shopped in the preference zone and reflects a degree of fidelity for relevant goods on the zone preference by calculating a shopping ratio for the relevant goods for a last shopping term. The shopping goods weight is calculated according to the following Equation 4.

[Equation 4]

$$\beta_1 = \frac{\left[C_{bought, area} \right]^{D_{last\_shopping} (D_{last\_shopping} - T_{period\_shopping})}}{C_{bought, total\_area}}$$

$$T_{period\_shopping} = \frac{S_{term\_shopping}}{C_{term\_shopping}}$$

$C_{term\_shopping}$: the number of times of shopping (visiting) of the consumer for a certain term

$S_{term\_shopping}$: shopping term standard (a month, quarter of a year, a year : optional items)

$T_{period\_shopping}$: shopping period (store visit period)

$[C_{bought\_area\_id}]^{D_{last\_shopping}}_{(D_{last\_shopping} - T_{period\_shopping})}$: the number of times of goods shopping in a relevant zone for a last shopping term

$C_{bought,total\_area}$: the number of time of goods shopping in all zones

The shopping time weight is a value used to correct preference for a relevant zone by calculating shopping time in the relevant zone in the zone preference of the consumer and grants objectivity to shopping time in the relevant zone by correcting shopping time errors caused by event goods, seasonal goods, and shopping periods of individual consumers. The shopping time weight is calculated according to the following Equation 5.

[Equation 5]

$$\beta_2 = \frac{[T_{shopping,area\_id}]^{D_{last\_shopping}}_{(D_{last\_shopping} - T_{period\_shopping})}}{[T_{shopping,area\_all}]^{D_{last\_shopping}}_{(D_{last\_shopping} - T_{period\_shopping})}}$$

$[T_{shopping,area\_id}]^{D_{last\_shopping}}_{(D_{last\_shopping} - T_{period\_shopping})}$: shopping time in

a relevant zone for a last shopping term

$$\left[T_{shopping,\,area\_all}\right]^{D_{last\_shopping}}_{(D_{last\_shopping}-\,T_{period\_shopping})}\;:\;\;\text{shopping time in}$$

all zones for a last shopping term

The shopping pattern analyzing unit 45 analyzes the consumer

profile, the shopping profile, and the shopping traffic line

information, which are stored in the database 50, groups the

shopping pattern for each item of the consumer profile, infers

shopping patterns for consumers who have similar profile

information, and then stores a result of the inference in the

database 50.

The shopping profile analyzing unit 46 generates or updates

the shopping profiles for the consumers with reference to the

consumer information and shopping history of the consumer and

shopping history of a consumer group related to the consumer, which

are stored in the database50, analyzes the generated or updated

shopping profiles, stores a result of the analysis in the database

50, and provides the stored result to the potential information

predicting unit 47 through a separate medium or directly.

The potential information predicting unit 47 transmits goods

recommendation information individualized with reference to goods

shopping particulars of the consumer, the shopping traffic line

information, the shopping profile and the zone preference, which

are stored in the database 50, to the consumer terminal 90 carried

by the consumer.

Fig. 8 is a flow chart illustrating a shopping pattern analysis method according to an embodiment of the present invention.

First, when the consumer enters the store and locates at a location within the store, the consumer location detecting unit 41 detects a current location of the consumer corresponding to the tag 11 according to a signal from the tag 11 sensed by the reader 21 (Step S801). Information on the detected location of the consumer is stored in the database 50.

When the current location of the consumer is detected, the shopping time checking unit 42 checks whether or not a term during which the consumer stays in a relevant zone is stay shopping time (Step S803).

When the term during which the consumer stays in the relevant zone exceeds a preset threshold value as minimal stay shopping time in the relevant zone, the term is determined to be the stay shopping time.

Next, the shopping traffic line tracing unit 43 traces the shopping traffic line of the consumer in association of the location information of the consumer with the relevant zone where the stay shopping time is generated, until the consumer finishes settlement for goods shopped by him and exits the store (Step S805). The information on the traced shopping traffic line is stored in the database 50.

The consumer information and the goods information obtained in the settlement procedure through the POS terminal 71 are stored

in the database 50.

Next, the preference zone analyzing unit 44 analyzes a preference zone of the consumer using the stay shopping time information and the goods shopping information of the relevant zone stored in the database 50 (Step S807). The analyzed preference zone information is stored in the database 50.

Next, the shopping pattern analyzing unit 45 analyzes the shopping pattern of the consumer using the shopping traffic line information, the stay shopping time information and the goods information, which are stored in the database 50 (Step S809), and stores a result of the analysis in the database 50.

Finally, the shopping profile analyzing unit 46 generates or updates the shopping profile of the consumer (Step S811), analyzes the generated or updated shopping profile, and then stores a result of the analysis in the database 50.

Fig. 9 is a flow chart illustrating a shopping pattern analysis method according to another embodiment of the present invention.

First, when the consumer enters the store, consumer information is registered in the database 50 (Step S901).

The registration of the consumer information is achieved by the wired/wireless terminal 80, which is installed at an entrance and exit spot of the store for identifying a card on which the consumer information is recorded in a contact or non-contact manner.

Next, the consumer location detecting unit 41 detects a

current location of the consumer in the store corresponding to the tag 11 according to a signal from the tag 11 sensed by the reader 21 (Step S903). Information on the detected location of the consumer is stored in the database 50.

5   When the current location of the consumer is detected, the shopping time checking unit 42 checks a term during which the consumer stays in a relevant zone, and determines whether or not the term exceeds a preset threshold value (Step S905).

        As a result of the determination, if the term during which
10   the consumer stays in the relevant zone exceeds the threshold value, the potential information predicting unit 47 searches for the shopping profile information of the consumer stored in the database 50 (Step S907), and determines whether or not information on a zone in which the consumer locates currently is included in the
15   shopping profile information of the consumer (Step 909).

        If it is determined that the information on the zone is included in the shopping profile information, a preference zone having the greatest number of times of visits of the consumer in the shopping profile information is selected (Step S911). The selected
20   preference zone is considered as a moving expectation zone of the consumer.

        Finally, the potential information predicting unit 47 transmits information on the selected preference zone and information on goods of interest in the relevant zone to the consumer
25   terminal 90 carried by the consumer (Step S913) and adds information

on the relevant zone to which the consumer moves to the shopping profile information (Step S915).

INDUSTRIAL APPLICABILITY

According to the present invention, by detecting locations of consumers in the store using RFID tags attached to shopping carts and analyzing shopping locations, shopping time and shopping traffic lines of the consumers, optimal store management and customized services for individual consumers using shopping patterns of the consumers in the store can be provided.

Particularly, the consumers can shop conveniently by providing recommendation of goods individualized according to current locations of the consumers in the store and information on locations of recommended goods.

In addition, according to the present invention, efficiency of store management can be improved by providing various kinds of information to a manager of the store so that he can analyze the present situation of the store visually or quantitatively through a monitoring terminal.

While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the appended claims and equivalents thereof.